Final Engagement

Attack, Defense & Analysis of a Vulnerable Network

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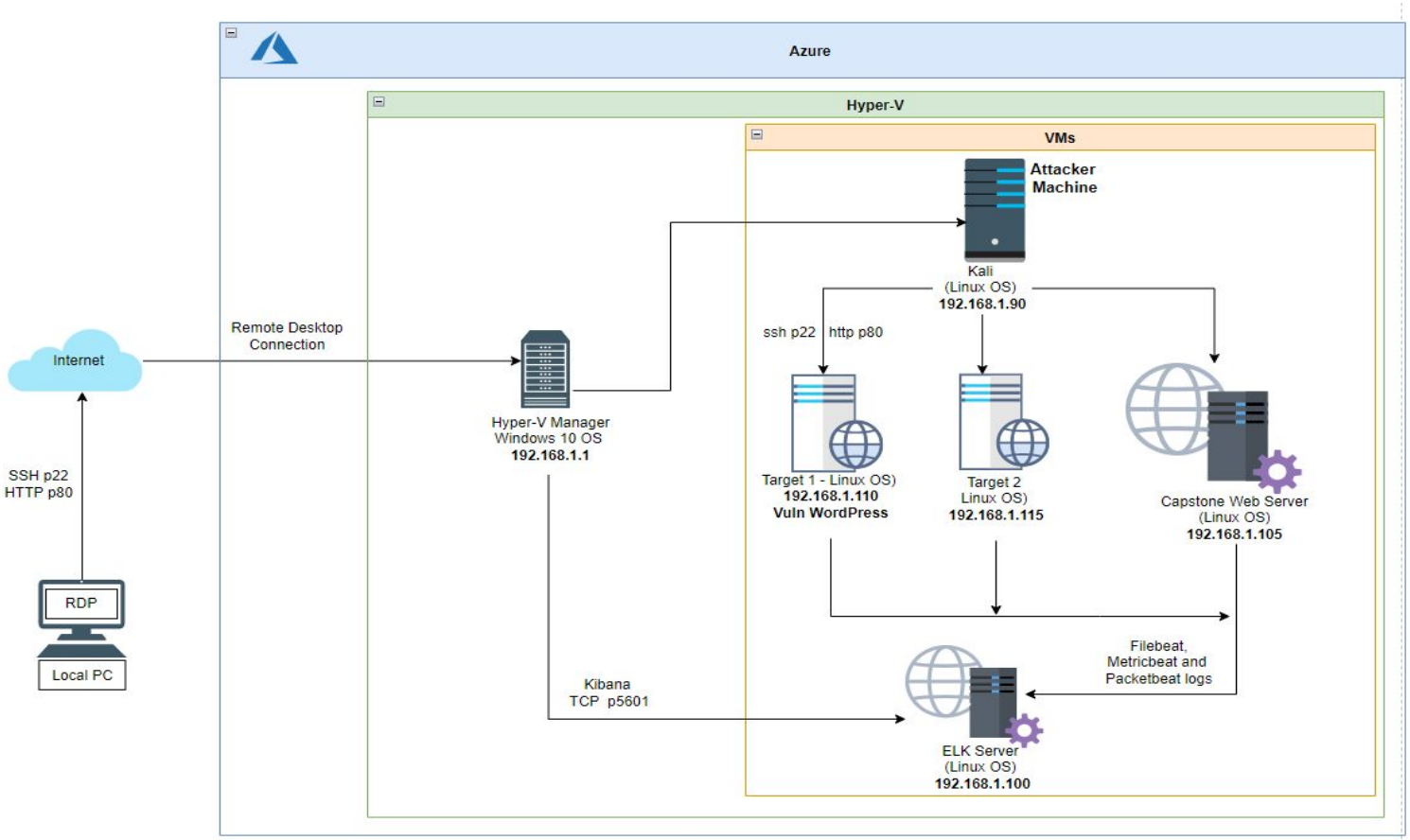
Network Topology



Network
Address Range:
192.168.1.0/24
Netmask:255.255.255.0
Gateway: 192.168.1.1

Machines
IPv4: 192.168.1.90
OS: Linux
Hostname: Kali

IPv4: 192.168.1.100
OS: Linux
Hostname: ELK

IPv4:192.168.1.105
OS: Linux
Hostname: Capstone

IPv4: 192.168.1.110
OS: Linux
Hostname: Target1

Critical Vulnerabilities: Target 1

Our assessment uncovered the following critical vulnerabilities in **Target 1**.

Vulnerability	Description	Impact
Lack of perimeter protection against malware.	Perimeter protection would scan all inbound files for malware and viruses.	User was able to download malware from Internet.
Lack of endpoint protection against malware.	Endpoint protection would scan all inbound files for malware and viruses.	User was able to download and save malware from Internet.
Lack of perimeter white listing of Internet sites.	Perimeter protection would allow access to white listed websites and IP addresses.	User was able to visit IP address that is black listed according to https://www.ipvoid.com
Lack of protection against content outside of organization's acceptable use policy.	BitTorrent does not normally have a business requirement.	User was able to download torrent file.
Lack of password policy for Wordpress.	There appears to be no minimum requirements for password complexity, account timeouts etc.	A bad actor can brute force the admin login.
Poorly configured Wordpress Instance.	Lack of restrictions around file permissions, connecting to MySQL with Root.	Provides access to the SQL account credentials set within the wp_config.php file. Root account has full control of the database.
Sudo privileges to python	The user Steven has sudo access to python.	A bad actor can escalate privileges to root via python.

Critical Vulnerabilities: Target 2

Our assessment uncovered the following critical vulnerabilities in **Target 2**.

Vulnerability	Description	Impact
phpMailer 5.2.17	Old version of software subject to CVE: 2016-10033. (https://packetstormsecurity.com/files/140280/PHPMailer-5.2.17-Remote-Code-Execution.html)	Able to launch a remote shell as web site user 'www-data'.
Default content files left in place.	Some files contain configuration information.	Exposure of information to make reconnaissance easier.

Traffic Profile

Traffic Profile

Our analysis identified the following characteristics of the traffic on the network:

Feature	Value	Description
Top Talkers (IP Addresses)	1) 172.16.4.205 2) 10.0.0.201 3) 185.243.115.84	Machines that sent the most traffic.
Most Common Protocols	1) TCP(85.7%) 2) UDP(14.1%) 3) OTHER(0.02%)	Three most common protocols on the network.
# of Unique IP Addresses	1) 811	Count of observed IP addresses.
Subnets	1) 10.6.12.0/24 2) 172.16.4.0/24 3) 10.0.0.0/24	Observed subnet ranges.
# of Malware Species	1) june11.dll	Number of malware (trojan) binaries identified in traffic.

Behavioral Analysis

Purpose of Traffic on the Network

- Users were observed engaging in the following kinds of activity.

“Normal” Activity

- Watching Youtube videos
- Looking into medical services
- Training Module/Trivia Game
- Looking into Bicycle Events and Cycling Tips

Suspicious Activity

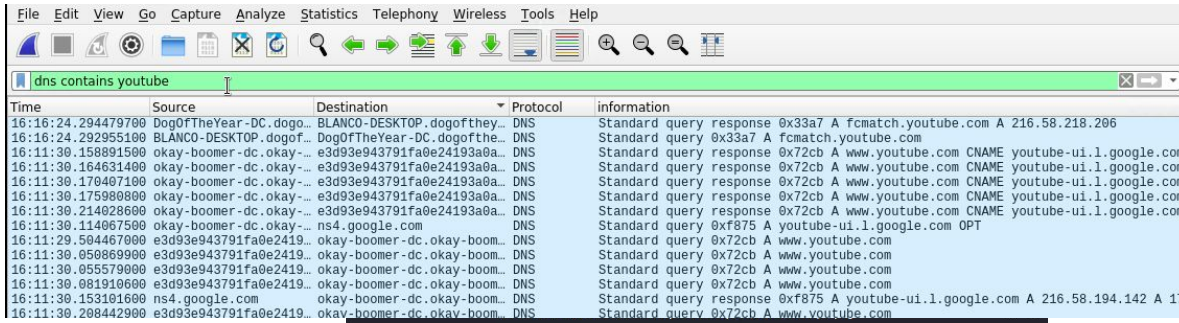
- Downloading Copyrighted Materials
- AD Server and Downloaded Malware
- Infected Windows Machine

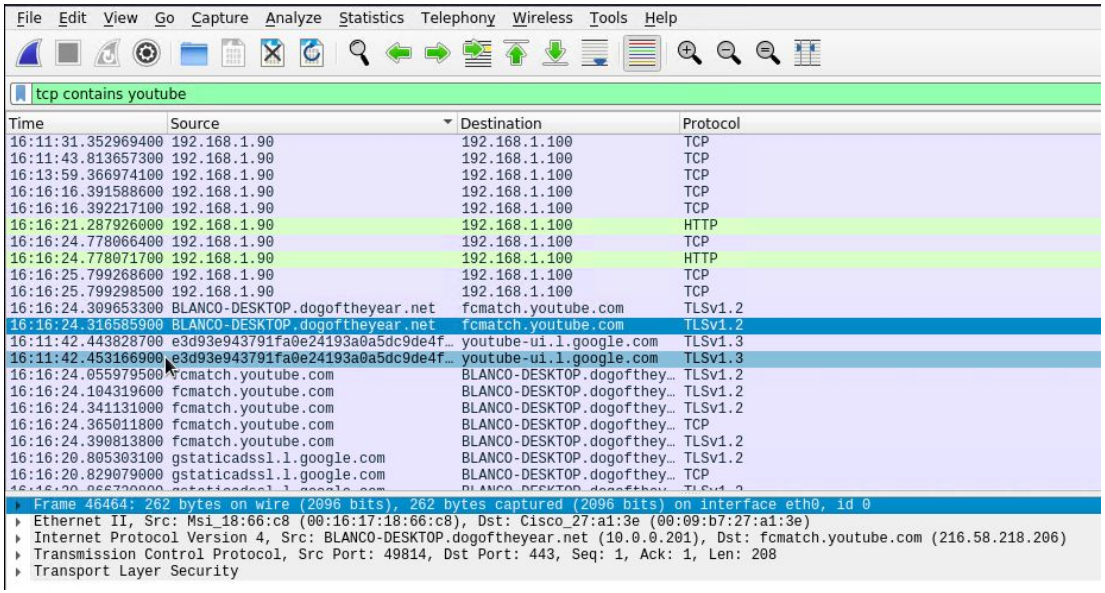
Normal Activity

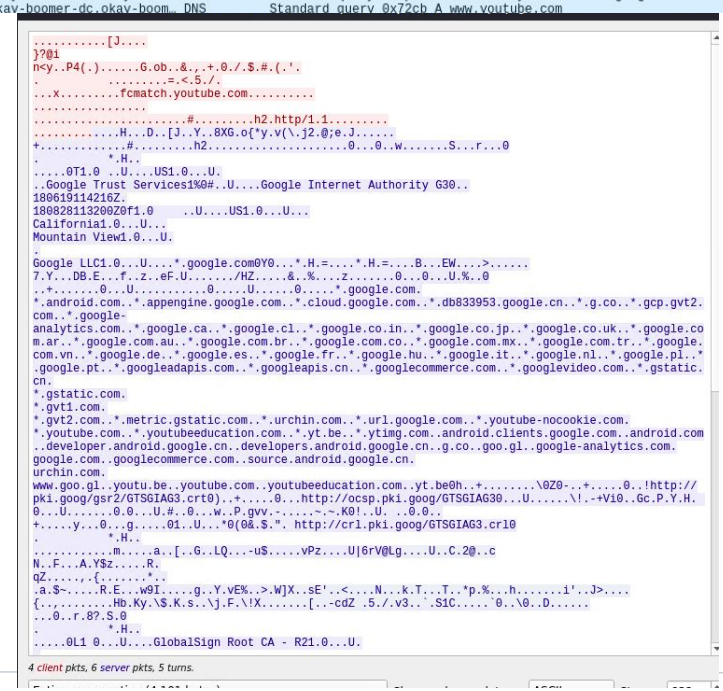
Normal #1: Watching Youtube videos

Summarize the following:

- What kind of traffic did you observe? Which protocol(s)? Transmission Control Protocol (TCP), TLSV1.2 (SSL Protocol), Domain Name Server (DNS)







Normal #2: Looking into medical services

WireShark.pcapng 01:21 PM

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

tcp contains hospital

Time	Source	Destination	Protocol	information
16:12:13.729160800	DESKTOP-B49J3FD.local	pictures.fasthealth.com	HTTP	GET /pictures/283239.png?last_modified=1567008594 HTTP/1.1
16:12:05.815675800	DESKTOP-B49J3FD.local	www.sabethahospital.com	HTTP	GET /getpage.php?name=whatappendixdo HTTP/1.1
16:12:05.995348800	DESKTOP-B49J3FD.local	www.sabethahospital.com	HTTP	GET /style.php HTTP/1.1
16:12:06.019976000	DESKTOP-B49J3FD.local	www.sabethahospital.com	HTTP	GET /splash/logo.png HTTP/1.1
16:12:06.027583500	DESKTOP-B49J3FD.local	www.sabethahospital.com	HTTP	GET /splash/button-2.jpg HTTP/1.1
16:12:06.035142100	DESKTOP-B49J3FD.local	www.sabethahospital.com	HTTP	GET /common_js/common_css.php?c=3281&mt=1573231401 HTTP/1.1
16:12:06.042167700	DESKTOP-B49J3FD.local	www.sabethahospital.com	HTTP	GET /common_js/start_facebook.js HTTP/1.1
16:12:06.049103400	DESKTOP-B49J3FD.local	www.sabethahospital.com	HTTP	GET /common_js/polyfills.js HTTP/1.1
16:12:07.636077400	DESKTOP-B49J3FD.local	www.sabethahospital.com	HTTP	GET /common_js/font-awesome-4.7.0/css/font-awesome.min.css HTTP/1.1

Wireshark · Follow TCP Stream (tcp.stream eq 206) · WireShark.pcapng

```
GET /splash/logo.png HTTP/1.1
Referer: http://www.sabethahospital.com/getpage.php?name=whatappendixdo
Accept: image/png,image/svg+xml,image/*;q=0.8,*/*;q=0.5
Accept-Language: en-US
Accept-Encoding: gzip, deflate
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like
Gecko) Chrome/70.0.3538.102 Safari/537.36 Edge/18.18362
Host: www.sabethahospital.com
Connection: Keep-Alive

HTTP/1.1 200 OK
Date: Mon, 11 Nov 2019 22:22:20 GMT
Server: Apache
Last-Modified: Tue, 17 Nov 2015 17:15:46 GMT
ETag: "1268291-3029-524bfad283480"
Accept-Ranges: bytes
```

https://www.sabethahospital.com

Kali Tools Kali Docs Kali Forums NetHunter Offensive Security Exploit-DB

14th & Oregon Street | Sabetha,

Employee E-mail

Home | About Us | Hospital | Family Practice | Home Health & Hospice | Monthly Health Topics | Services | Visitor Information | SCH Volunteer

CaptureRx Security Incident

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

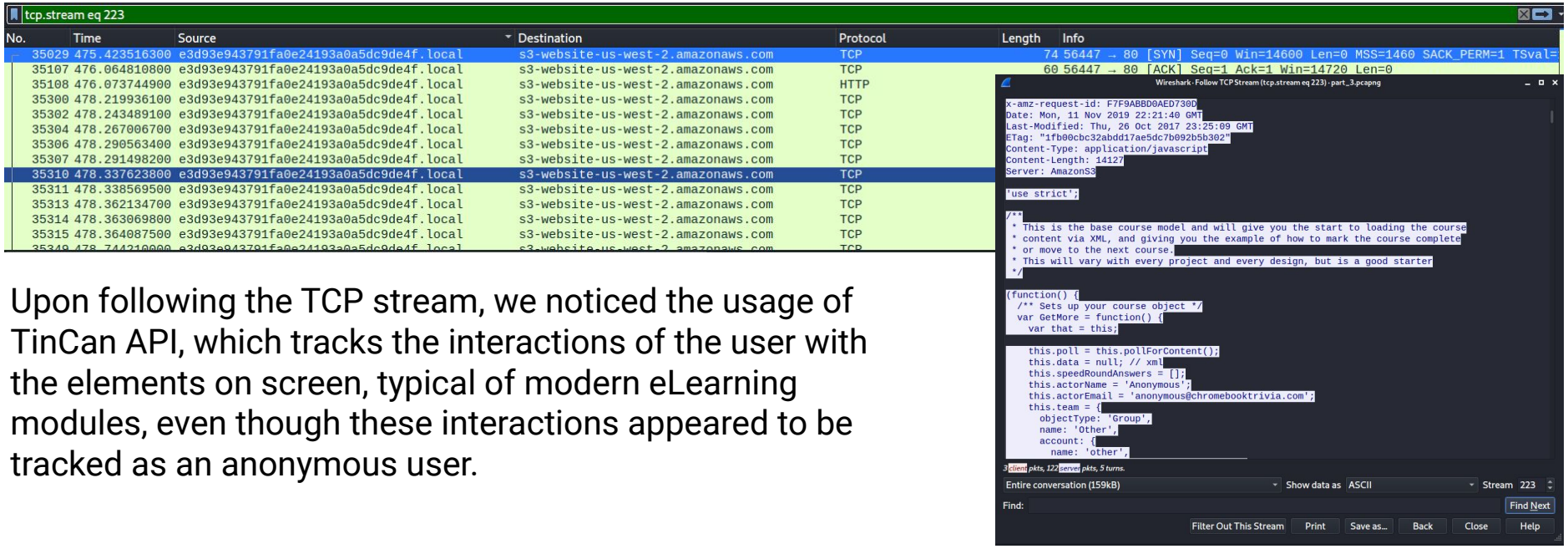
dns contains hospital

Time	Source	Destination	Protocol	information
16:11:54.066940600	DESKTOP-B49J3FD.local	okay-boomer-dc.okay-boom…	DNS	Standard query 0xfd32 A www.sabethahospital.com
16:11:54.068515600	okay-boomer-dc.okay-…	DESKTOP-B49J3FD.local	DNS	Standard query response 0xfd32 A www.sabethahospital.com A 12.133.50.21

Normal #3: Training Module/Trivia Game

Summarize the following:

- Protocols used for this behaviour include TCP and HTTP, as seen in the screenshot below (initial filter used “tcp contains google”):



tcp.stream eq 223

No.	Time	Source	Destination	Protocol	Length	Info
35029	475.423516300	e3d93e943791fa0e24193a0a5dc9de4f.local	s3-website-us-west-2.amazonaws.com	TCP	74	56447 → 80 [SYN] Seq=0 Win=14600 Len=0 MSS=1460 SACK_PERM=1 TSval=
35107	476.064810800	e3d93e943791fa0e24193a0a5dc9de4f.local	s3-website-us-west-2.amazonaws.com	TCP	60	56447 → 80 [ACK] Seq=1 Ack=1 Win=14720 Len=0
35108	476.073744900	e3d93e943791fa0e24193a0a5dc9de4f.local	s3-website-us-west-2.amazonaws.com	HTTP		
35300	478.219936100	e3d93e943791fa0e24193a0a5dc9de4f.local	s3-website-us-west-2.amazonaws.com	TCP		
35302	478.243489100	e3d93e943791fa0e24193a0a5dc9de4f.local	s3-website-us-west-2.amazonaws.com	TCP		
35304	478.267006700	e3d93e943791fa0e24193a0a5dc9de4f.local	s3-website-us-west-2.amazonaws.com	TCP		
35306	478.290563400	e3d93e943791fa0e24193a0a5dc9de4f.local	s3-website-us-west-2.amazonaws.com	TCP		
35307	478.291498200	e3d93e943791fa0e24193a0a5dc9de4f.local	s3-website-us-west-2.amazonaws.com	TCP		
35310	478.337623800	e3d93e943791fa0e24193a0a5dc9de4f.local	s3-website-us-west-2.amazonaws.com	TCP		
35311	478.338569500	e3d93e943791fa0e24193a0a5dc9de4f.local	s3-website-us-west-2.amazonaws.com	TCP		
35313	478.362134700	e3d93e943791fa0e24193a0a5dc9de4f.local	s3-website-us-west-2.amazonaws.com	TCP		
35314	478.363069800	e3d93e943791fa0e24193a0a5dc9de4f.local	s3-website-us-west-2.amazonaws.com	TCP		
35315	478.364087500	e3d93e943791fa0e24193a0a5dc9de4f.local	s3-website-us-west-2.amazonaws.com	TCP		

Wireshark · Follow TCP Stream (tcp.stream eq 223) · part_3.pcapng

```
x-amz-request-id: F7F9ABBD0AED7300
Date: Mon, 11 Nov 2019 22:21:40 GMT
Last-Modified: Thu, 26 Oct 2017 23:25:09 GMT
ETag: "1fb00cbc32abdd17ae5dc7b092b5b302"
Content-Type: application/javascript
Content-Length: 14127
Server: AmazonS3

'use strict';

/**
 * This is the base course model and will give you the start to loading the course
 * content via XML, and giving you the example of how to mark the course complete
 * or move to the next course.
 * This will vary with every project and every design, but is a good starter
 */

(function() {
  /** Sets up your course object */
  var GetMore = function() {
    var that = this;

    this.poll = this.pollForContent();
    this.data = null; // xml
    this.speedRoundAnswers = [];
    this.actorName = 'Anonymous';
    this.actorEmail = 'anonymous@chromebooktrivia.com';
    this.team = {
      objectType: 'Group',
      name: 'Other',
      account: {
        name: 'other',
```

3 client pkts, 122 server pkts, 5 turns.

Entire conversation (159kB) | Show data as ASCII | Stream 223

Find: | Find Next

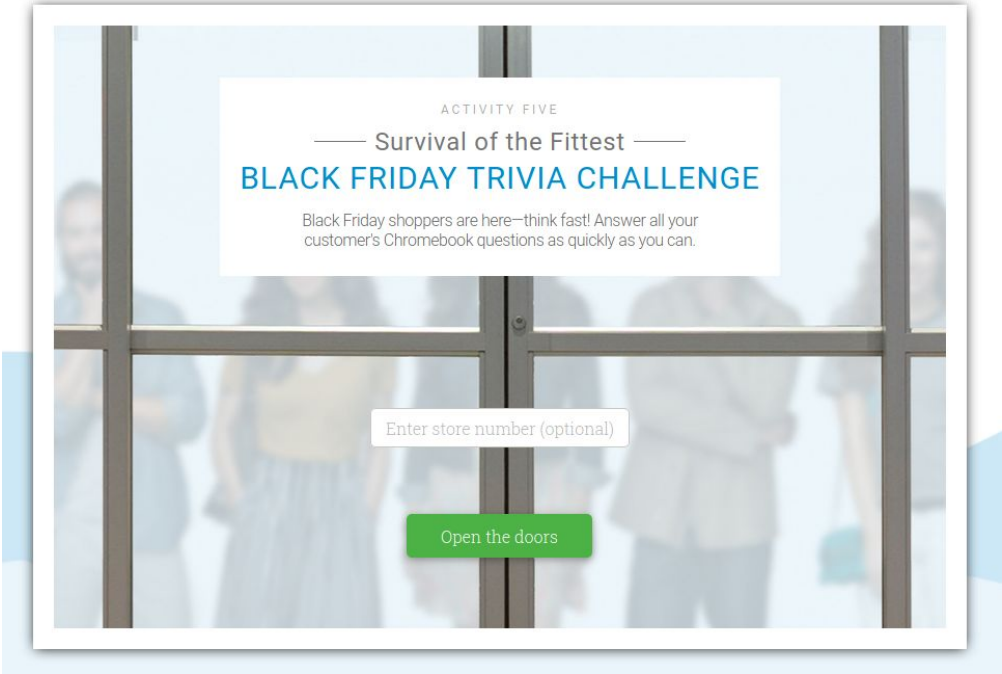
Filter Out This Stream | Print | Save as… | Back | Close | Help

Upon following the TCP stream, we noticed the usage of TinCan API, which tracks the interactions of the user with the elements on screen, typical of modern eLearning modules, even though these interactions appeared to be tracked as an anonymous user.

Normal #3 (cont): Training Module/Trivia Game

Summarize the following:

- The user was accessed and interacted with a trivia challenge activity, located at http://www.chromebooktrivia.com. From the records, we can see that the server is located in AWS.



Normal #4: Looking into Bicycle Events and Cycling Tips

- Summarize the following:
  - Protocols used for this behaviour include HTTP and TCP, as seen in the screenshot below (initial filter used “tcp contains google”):

tcp.stream eq 520

No.	Time	Source	Destination	Protocol
53979	637.425744100	10.11.11.121	orbike.com	TCP
53983	637.430346500	10.11.11.121	orbike.com	TCP
53985	637.441169700	10.11.11.121	orbike.com	HTTP
53995	637.610378000	10.11.11.121	orbike.com	TCP
53996	637.611422400	10.11.11.121	orbike.com	TCP
53997	637.612476000	10.11.11.121	orbike.com	TCP
53998	637.613530200	10.11.11.121	orbike.com	TCP
53999	637.614589600	10.11.11.121	orbike.com	TCP
54000	637.615637600	10.11.11.121	orbike.com	TCP
54001	637.616695200	10.11.11.121	orbike.com	TCP
54002	637.617751400	10.11.11.121	orbike.com	TCP
54007	637.630697100	10.11.11.121	orbike.com	HTTP
54018	637.803356900	10.11.11.121	orbike.com	TCP
54019	637.804409200	10.11.11.121	orbike.com	TCP

Wireshark · Follow TCP Stream (tcp.stream eq 520) · part_3.pcapng

```
GET / HTTP/1.1
Host: orbike.com
Connection: keep-alive
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Linux; Android 9; SAMSUNG SM-N950U) AppleWebKit/537.36 (KHTML, like
Gecko) SamsungBrowser/10.1 Chrome/71.0.3578.99 Mobile Safari/537.36
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,image/apng,*/*;q=0.8
Referer: https://www.google.com/
Accept-Encoding: gzip, deflate
Accept-Language: en-US,en;q=0.9,ko-KR;q=0.8,ko;q=0.7
Cookie: _ga=GA1.2.2905005.1573510360; _gid=GA1.2.1395558662.1573510360

HTTP/1.1 200 OK
Server: openresty
Date: Mon, 11 Nov 2019 22:24:23 GMT
Content-Type: text/html; charset=UTF-8
Transfer-Encoding: chunked
Connection: keep-alive
Link: <http://orbike.com/wp-json/>; rel="https://api.w.org/"
X-TEC-API-VERSION: v1
X-TEC-API-ROOT: http://orbike.com/wp-json/tribe/events/v1/
X-TEC-API-ORIGIN: http://orbike.com
Content-Encoding: gzip
X-Varnish: HIT
Age: Mon, 11 Nov 2019 22:12:38 GMT

250a
...........XmS....|...P..$S..I      .`Z...3...pO{K.Ql....+)o.......C..=......gW..v.
9(...._...@F!.....C.i.e.]o[.I..}~..x.l......J.b.ZV....@..iY.....M.}.{a....._
..4=.i.....q...).....3m
.8........N.t.h.o.....3"V,6S\.=.b}..9..%~.;...m...AD$N!..}@...f.$.
4...h....M....'-....".....!.p....lyTHN{.u.......W.9.1)rr}..l.#..
```

2 client pkts, 16 server pkts, 3 turns.

Entire conversation (20kB) | Show data as ASCII | Stream 520

Find: | Find Next

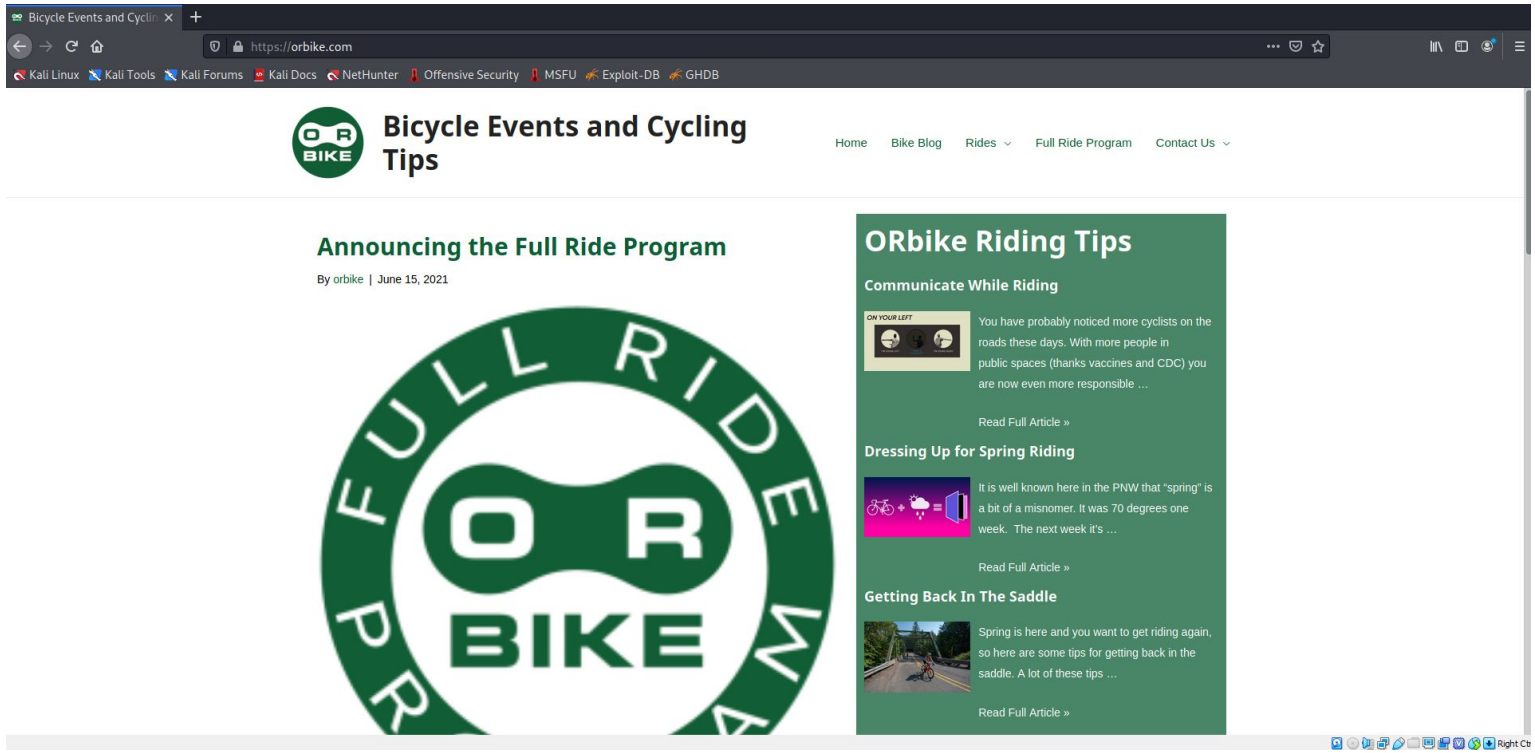
Filter Out This Stream | Print | Save as... | Back | Close | Help

Looking closer at the HTTP request, we can see that the user went to this page via Google as specified in the **Referer** field of the request.

Normal #4 (cont): Looking into Bicycle Events and Cycling Tips

Summarize the following:

- The user was browsing a Bicycle Events and Cycling tips, located at https://orbike.com

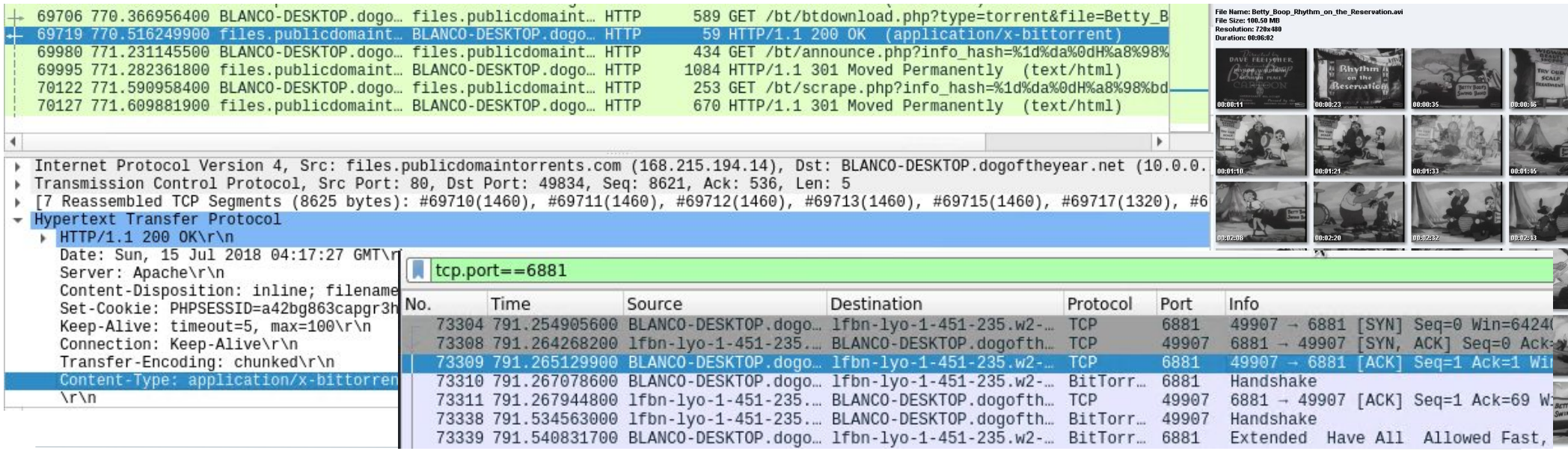


Malicious Activity

Malicious #1: Downloading Copyrighted Materials

Summarize the following:

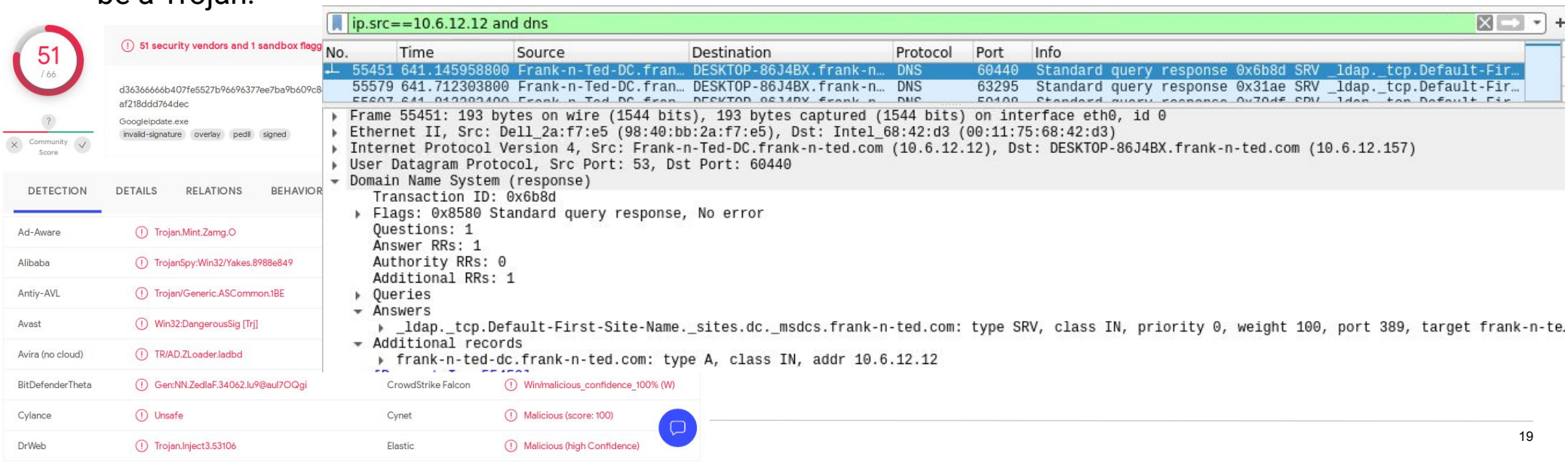
- Torrent traffic was observed on the network (BitTorrent, TCP and HTTP protocols).
- The user was browsing through animated movies on http://publicdomaintorrents.info and downloaded one torrent file - “Betty Boop Rhythm on the Reservation.avi.torrent”.
- Packet 69706 is the HTTP GET request for the file, the response including the file is 69719.



Malicious #2: AD Network and Downloaded Malware

Summarize the following:

- Traffic related to a rogue Active Directory server has been observed. Protocols include LDAP, KRB5 (Kerberos), DNS.
- Two users created frank-n-ted.com (10.6.12.12).
- A client that was part of this domain downloaded a malware file called june11.dll. This file appears to be a Trojan.

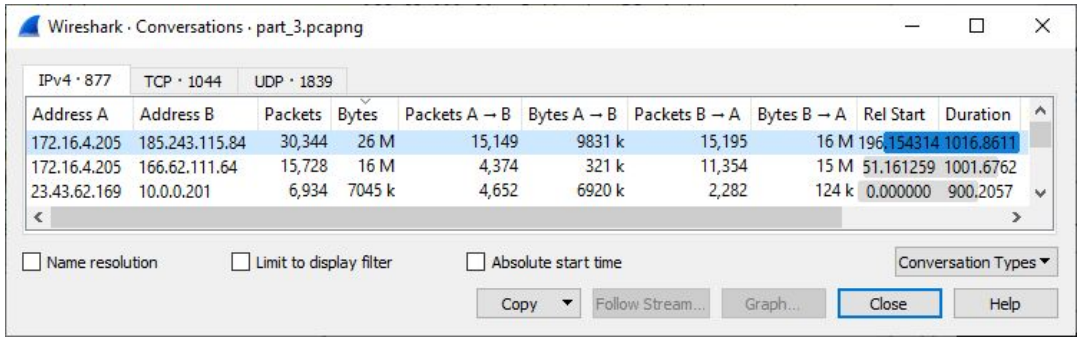


Malicious #3: Infected Windows Machine

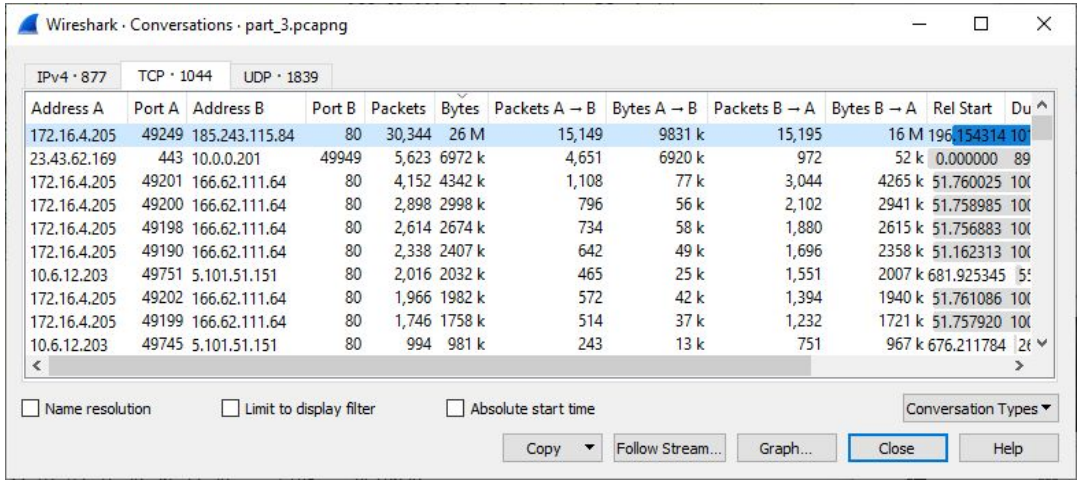
Summarize the following:

- What kind of traffic did you observe?
  Massive amount of traffic <u>from</u> 185.243.115.84 (b5689023.green.mattingsolutions.co)

- Which protocol(s)?
  HTTP (tcp/80)



Address A	Address B	Packets	Bytes	Packets A → B	Bytes A → B	Packets B → A	Bytes B → A	Rel Start	Duration
172.16.4.205	185.243.115.84	30,344	26 M	15,149	9831 k	15,195	16 M	196.154314	1016.8611
172.16.4.205	166.62.111.64	15,728	16 M	4,374	321 k	11,354	15 M	51.161259	1001.6762
23.43.62.169	10.0.0.201	6,934	7045 k	4,652	6920 k	2,282	124 k	0.000000	900.2057

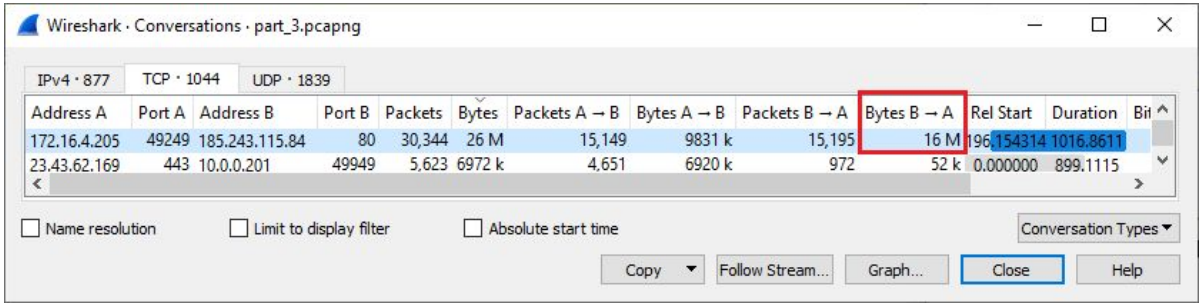


Address A	Port A	Address B	Port B	Packets	Bytes	Packets A → B	Bytes A → B	Packets B → A	Bytes B → A	Rel Start	Du
172.16.4.205	49249	185.243.115.84	80	30,344	26 M	15,149	9831 k	15,195	16 M	196.154314	10
23.43.62.169	443	10.0.0.201	49949	5,623	6972 k	4,651	6920 k	972	52 k	0.000000	89
172.16.4.205	49201	166.62.111.64	80	4,152	4342 k	1,108	77 k	3,044	4265 k	51.760025	10
172.16.4.205	49200	166.62.111.64	80	2,898	2998 k	796	56 k	2,102	2941 k	51.758985	10
172.16.4.205	49198	166.62.111.64	80	2,614	2674 k	734	58 k	1,880	2615 k	51.756883	10
172.16.4.205	49190	166.62.111.64	80	2,338	2407 k	642	49 k	1,696	2358 k	51.162313	10
10.6.12.203	49751	5.101.51.151	80	2,016	2032 k	465	25 k	1,551	2007 k	681.925345	5
172.16.4.205	49202	166.62.111.64	80	1,966	1982 k	572	42 k	1,394	1940 k	51.761086	10
172.16.4.205	49199	166.62.111.64	80	1,746	1758 k	514	37 k	1,232	1721 k	51.757920	10
10.6.12.203	49745	5.101.51.151	80	994	981 k	243	13 k	751	967 k	676.211784	26

Malicious #3 (cont): Infected Windows Machine

Summarize the following:

- What, specifically, was the user doing? Which site were they browsing? Downloading from 182.243.115.84



Address A	Port A	Address B	Port B	Packets	Bytes	Packets A → B	Bytes A → B	Packets B → A	Bytes B → A	Rel Start	Duration	Bit
172.16.4.205	49249	185.243.115.84	80	30,344	26 M	15,149	9831 k	15,195	16 M	196.154314	1016.8611	
23.43.62.169	443	10.0.0.201	49949	5,623	6972 k	4,651	6920 k	972	52 k	0.000000	899.1115	

- Include screenshots of packets justifying your conclusions.

(ip.addr == 172.16.4.205 && ip.addr == 185.243.115.84) && http.request.method == "POST"

No.	Time	Source	Source Address	Destination	Destination Address	Info
13010	196.168142500	Rotterdam-PC.mind-hammer.net	172.16.4.205	b5689023.green.mattingsolutions.co	185.243.115.84	POST /empty.gif HTTP/1.1 (application/x-www-form-urlencoded)
13086	196.795147600	Rotterdam-PC.mind-hammer.net	172.16.4.205	b5689023.green.mattingsolutions.co	185.243.115.84	POST /empty.gif HTTP/1.1 (application/x-www-form-urlencoded)
23682	335.615005700	Rotterdam-PC.mind-hammer.net	172.16.4.205	b5689023.green.mattingsolutions.co	185.243.115.84	POST /empty.gif HTTP/1.1 (application/x-www-form-urlencoded)
27702	398.455630400	Rotterdam-PC.mind-hammer.net	172.16.4.205	b5689023.green.mattingsolutions.co	185.243.115.84	POST /empty.gif?ss&ss1img HTTP/1.1 (PNG)
31721	461.182108400	Rotterdam-PC.mind-hammer.net	172.16.4.205	b5689023.green.mattingsolutions.co	185.243.115.84	POST /empty.gif?ss&ss2img HTTP/1.1 (PNG)

- Include a description of any interesting files.
  - empty.gif would crash the Kali virtual machine when attempting to export it from Wireshark.

The End